CHANNEL QUALITY INDICATOR REPORTING

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This patent application is a continuation application of U.S. patent application Ser. No. 13/344,711, filed Jan. 6, 2012, which claims priority under 35 U.S.C. §119(e) from Provisional Patent Application No. 61/430,594, filed Jan. 7, 2011, the disclosure of which are incorporated by reference herein in its entirety.

TECHNICAL FIELD

[0002] The exemplary and non-limiting embodiments of this invention relate generally to wireless communication systems, methods, devices and computer programs and, more specifically, relate to the reporting of channel quality indicator information from a mobile node to a network access node.

BACKGROUND

[0003] This section is intended to provide a background or context to the invention that is recited in the claims. The description herein may include concepts that could be pursued, but are not necessarily ones that have been previously conceived, implemented or described. Therefore, unless otherwise indicated herein, what is described in this section is not prior art to the description and claims in this application and is not admitted to be prior art by inclusion in this section.

[0004] The following abbreviations that may be found in the specification and/or the drawing figures are defined as follows:

[0005] 3GPP third generation partnership project
[0006] BS base station
[0007] CA carrier aggregation
[0008] CC component carrier
[0009] CE control element
[0010] CQI channel quality indication
[0011] CSI RS channel state information reference signal
[0012] DL downlink (eNB towards UE)
[0013] eNB E-UTRAN Node B (evolved Node B)
[0014] EPC evolved packet core
[0015] E-UTRAN evolved UTRAN (LTE)
[0016] FDMA frequency division multiple access
[0017] GNSS global navigation satellite system
[0018] ICO in-device coexistence interference avoidance
[0019] IMTA international mobile telecommunications association
[0020] ITU-R international telecommunication union-radiocommunication sector
[0021] LTE long term evolution of UTRAN (E-UTRAN)
[0022] LTE-A LTE advanced
[0023] MAC medium access control (layer 2, L2)
[0024] SU-MIMO single user multiple input multiple output
[0025] MM/MME mobility management/mobility management entity
[0026] NodeB base station
[0027] OFDMA orthogonal frequency division multiple access
[0028] O&M operations and maintenance
[0029] OOR out of range
[0030] PDCP packet data convergence protocol
[0031] PHY physical (layer 1, L1)
[0032] Rel release
[0033] RLC radio link control
[0034] RRC radio resource control
[0035] RRM radio resource management
[0036] SCell serving cell
[0037] SGW serving gateway
[0038] SC-FDMA single carrier, frequency division multiple access
[0039] TM transmission mode
[0040] UE user equipment, such as a mobile station, mobile node or mobile terminal
[0041] UL uplink (UE towards eNB)
[0042] UPE user plane entity
[0043] UTRAN universal terrestrial radio access network

[0044] One modern communication system is known as evolved UTRAN (E-UTRAN, also referred to as UTRAN-LTE or as E-UTRA). In this system the DL access technique is OFDMA, and the UL access technique is SC-FDMA.

[0045] One specification of interest is 3GPP TS 36.300, V8.11.0 (2009-12), 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Access Network (EUTRAN); Overall description; Stage 2 (Release 8), incorporated by reference herein in its entirety. This system may be referred to for convenience as LTE Rel-8. In general, the set of specifications given generally as 3GPP TS 36.xyz (e.g., 36.211, 36.311, 36.312, etc.) may be seen as describing the Release 8 LTE system. More recently, Release 9 versions of at least some of these specifications have been published.

[0046] FIG. **1** reproduces FIG. **4.1** of 3GPP TS 36.300 V8.11.0, and shows the overall architecture of the EUTRAN system (Rel-8). The E-UTRAN system includes eNBs, providing the E-UTRAN user plane (PDCP/RLC/MAC/PHY) and control plane (RRC) protocol terminations towards the UEs. The eNBs are interconnected with each other by means of an X2 interface. The eNBs are also connected by means of an S1 interface to an EPC, more specifically to a MME by means of a S1 MME interface and to a S-GW by means of a S1 interface (MME/S-GW 4). The S1 interface supports a many-to-many relationship between MMEs/S-GWs/UPEs and eNBs.

[0047] The eNB hosts the following functions:

[0048] functions for RRM: RRC, Radio Admission Control, Connection Mobility Control, Dynamic allocation of resources to UEs in both UL and DL (scheduling);

[0049] IP header compression and encryption of the user data stream;

[0050] selection of a MME at UE attachment;

[0051] routing of User Plane data towards the EPC (MME/S-GW);

[0052] scheduling and transmission of paging messages (originated from the MME);

[0053] scheduling and transmission of broadcast information -(originated from the MME or O&M); and

[0054] a measurement and measurement reporting configuration for mobility and scheduling.

[0055] Of particular interest herein are the further releases of 3GPP LTE (e.g., LTE Rel-10) targeted towards future IMTA systems, referred to herein for convenience simply as LTE-Advanced (LTE-A). Reference in this regard may be